



Review

The Botany, Chemistry, Pharmacological and Therapeutic Application of *Psoralea corylifolia* L. – A Review

Shilandra Kumar Uikey^{1*}, A.S. Yadav¹, Ajit K. Sharma¹, Atul K. Rai¹,
D.K. Raghuwanshi¹, and Yogesh Badkhane¹

*Corresponding author:

Shilandra Kumar Uikey

¹Molecular Biology and

Seed Technology

Laboratory,

Department of Botany,

Govt. Motilal Vigyan

Mahavidyalaya Bhopal-

462008 (MP) India

E-mail –

shilandra.yogesh@gmail.com

Abstract

Psoralea corylifolia Linn. is an endangered and medicinally important plant indigenous to tropical and subtropical regions of the world. Its medicinal usage is reported in Indian pharmaceutical codex, the Chinese, British and the American pharmacopoeias and in different traditional system of medicines such as Ayurveda, Unani and Siddha. The review reveals that wide ranges of phytochemical constituents have been isolated from the plant and it possesses important activities like antibacterial, anti-inflammatory and antitumor. Various other activities like hepatoprotective, antioxidants and antihelminthic have also been reported. These reports are very encouraging and indicate that herb should be studied more extensively for its therapeutic benefits.

This article briefly reviews the botany, pharmacology, biochemistry and therapeutic application of the plant. This is an attempt to compile and document information on different aspects of *Psoralea corylifolia* and highlight the need for research and development.

Key words - Psoralen, Isopsoralen, Pharmacological activities, *Psoralea corylifolia* Linn.

Introduction

Plant and produce are being used as a source of medicine since long. According to World Health Organization (WHO) more than 80% of the world's population, mostly in poor and less developed countries depend on traditional plant based medicines for their primary health care needs [1]. Medicinal plants are the nature's gift to human beings to make disease free healthy life. It plays a vital role to preserve our health. India is one of the most medico- culturally diverse

countries in the world where the medicinal plant sector is a part of time- honored tradition that is a respected even today. Here, the main traditional systems of medicine include Ayurveda, Unani and Siddha. The earliest mention of the use of plant in medicine is found in the Rigveda, which was written between 4500 and 1600 BC. During British period due to Western culture our Traditional art of natural healing is disappeared. Now it is reappearing due to realization of its

important in curing disease without any side effect.

Owing to the global trend towards improved “quality of life” there is considerable evidence of an increase in demand for medicinal plant [2]. Use of plants for treating various ailments of both man and animal is as old practice a man himself. India is richly endowed with a wide variety of plants having medicinal value. These plants are widely used by all section of the society whether directly as folk remedies or indirectly as pharmaceutical preparation of modern medicine [3]. In recent times, focus on plant research has increased all over the world and a large body of evidence has collected to show immense potential of medicinal plat used in various tradition system (Ayurveda, Siddha and Unani) [4]. Medicinal plants are a major source a biodynamic compounds of therapeutic value [5].

Medicinal plants are assuming greater importance in the primary health care of individuals and communities in many developing countries. There has been an increases of demand in international trade because of very effective, cheaply available, supposedly have less or no side effects and used as alternative to allopathic medicines. Medicinal plant are believed to be much safer and proved elixir in the treatment on various ailments [6]

***Psoralea corylifolia*: the plant**

Psoralea Linn.: A large genus of herbs, shrubs or undershrubs distributed in tropical and sub tropical region of the world [7]. Four species are found in India of which one is exotic [8]. *Psoralea corylifolia* is known by an array of names, suggesting its widespread use. *Psoralea* is called babchi, babachi, bavanchi, Bkchi in Hindi [9], Anindavi, Asitatvacha, Avalguja Bakuchi, Chandralekha, Chandra Prabha chandraraji, Kalameshi, Kamboji, Kantaka Krishna, Krishnaphala, Sita, Sitavari soma, Somaraji and Supraha in Sanskrit, Ravoli in Srhilanka[10],



Fig :1 Plant in vegetative phase

Boh-gol zhee in Korea [11] , Buguzhi in Chinese [12], Barachi, Bavochi, hakuch and latakasturi in Bengal, babchi, bavacha Bawachi in Gujarat. It is also called Bavachya, babchi, bavachi (Marathi) waghchi (Presion); Karpokarishi, Karpurvarishi (Tamil); Bhavanji, Kalangiya, Karubogi, Koriasthan (Telugu). Babechi (Urdu), bakuchi (Uriya). The trade name of *P. corylifolia* is babchi and bakuchi [13].



Fig :2 A 2 fit tallplant before flowering

Scientific classification

Kingdom: Plantea
Division: Magnoliophyta
Class: Magnoliopsida
Order: Fabales
Family: Fabaceae
Genus: *Psoralea*

Botanical name: *Psoralea corylifolia* L.



Fig :4 Flowering panicle during seed set



Fig :3 Flowering twig

Botanical identification

Psoralea corylifolia grows as winter season weed. It is an erect annual herb, 30 -180 cm. high, found almost throughout India. Leaves broadly elliptic, incisodentate; flower yellow or bluish purple, in dense axillary, long-peduneled heads; pods small, 3.5-4.5 mm.×2.0 -3.0 mm., ovoid- oblong, somewhat compressed, mucronate, dark chocolate to almost black; seed one, smooth, adhering to the pericarp (Figure 1). The plant is harvested for the drug industry when it sets into flowering in Nov-March. Seed setting



Fig :5 Seed

commences around April -May and seed germinate immediately after shading. *Psoralea corylifolia* is propagated by seed germination, However seed germination percentage is very low (5-7%) because of hard seed coat [14]; of this useful plant, hence, it is felt that there is an urgent need for cultivation of this endangered and medicinally important plant species. An observation at the post-germination growth stage

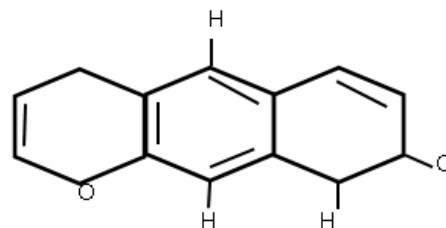


Fig :6 Root of a mature one year old plant

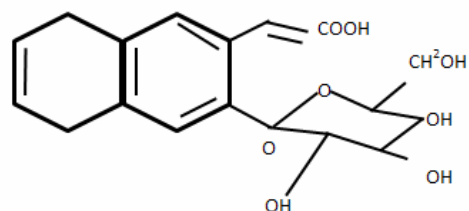
revealed that *Psoralea corylifolia* is a slow-growing species [15]. Low germination percentage and viability of the seeds, long gestation periods and delicate field-handling are some of the factors which discourage commercial cultivation of the plant.

Active constituents of *Psoralea corylifolia*

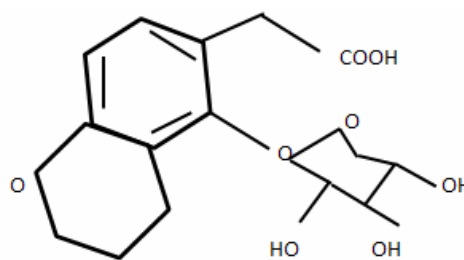
The major active constituents of *P.corylifolia* are corylifols a-c (prenylflavonoids) that are present in the seeds [16], other active compounds such as psoralen, isopsoralen and neobavaisflavones are found in the dried ripe fruits (Fig-1)[17]. Daidzein (4:7 dihydroxyisoflavon) and genistein (4'5'7 trihydroxyisoflavon) are present in natural plants of *P. corylifolia* as well as *in-vitro* cultures [18]. Other active constituents have since been identified, including neobavaisflavone, borachin, Bavaisflavone, bavachalcone, bavachromene psoralidin, corylifolinin, barachini psoralenoside, isopsoralenoside and coumarins [19][20].



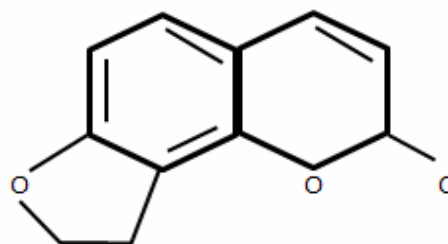
Psoralen



Psoralenoside



Iso psoralenoside



Isopsoralen

Medicinal value of *Psoralea corylifolia*

Almost the plant is used by the Indian traditional system of medicine for the treatment of various skin diseases in human being. In particular, the seed of *P. corylifolia* has significant medicinal properties.

Traditional Uses

The seeds have great medicinal value. The plant is used both internally as well as externally. The seed oil is extremely beneficial, externally in numerous skin ailments. In hypopigmented lesions if the skin likes leucoderma and psoriasis respond well, to local application along with oral therapy. In leucoderma, the seed powder of Bakuci mixed with Haratala Bhasma (Yellow arsenic), in 4:1 proportion and mashed with the cow's urine. This paste is applied on the lesions of leucoderma [21]. In scabies and ringworm infestations, the bakuchi seed powder mixed with buttermilk is applied externally. In leprosy, the seed oil is recommended orally, with beatlenut leaf. amalaki and Khadira are valuable adjuvants, with bakuchi, in dermatoses [22]. In chronic skin disease, a mixture of bakuchi and karanja oil is commonly used with vaseline, Scabies, Psoriasis ringworm and tinea versicolor are treated successfully with bakuchi [23].

Pharmacological activities

Psoralea corylifolia has been used in Ayurveda as a laxative, aphrodisiac, antihelminthic, diuretic and diaphoresiac in fibril condition. The plant finds use in about many Ayurvedic formulations, which include traditional formulation. Blood puri (containing 40 mg seed extract per 200 ml syrup), Safi (containing 9.09 mg seed extract per 5 ml syrup) and purim (containing 36 mg seed extract per tablet) are some formulation containing *P. corylifolia* developed by Indian Ayurveda.

Antibacterial: Three new prenylflavonoids, namely corylifols A-C (1-3), were isolated from the seed of *P. corylifolia* showed antibacterial activity against *Staphylococcus aureus* and *S. epidermidis* [24].

Antifungal activity: The plant possess potent inhibitory activity against 4 species of fungi viz. *Trichophyton rubrum*, *Trichophyton mentagrophytes*, *Epidermophyton floccosum* and *Microsporum gypseum* [25].

Antitumor activity

The activity-oriented fractionation of *Psoralea corylifolia* led to and isolation of a (+) bakuchil 1 as an active principle of its antitumoral property in vitro. It was observed to exhibit a mild cytotoxicity against five kinds of cultured human cancer cell lines. i.e. the A549, SK-OV-3, SK-MEL-2, XF498 and HCT-15. The synthesized 2,3 epoxide of bakuchiol showed the similar activity as the bakuchiol. Whereas the other oxidation derivatives 4 and 5 including the acetyl (+) bakuchiol 2 showed a decreased activity [26].

Pesticidal activity

The pure compound 6-(3-methyl but -2-enyl) 6-7 dihydroxycoumestan 1 isolated from chloroform extract of the seed of *P. corylifolia* L. was evaluated for the pesticidal activity against both adults and different instars of *Tribolium castaneum* Hebrst. [27].

Anti-inflammatory

The chloroform extract of seed at a dose of 400 mg/kg is effective against carageenin induced paw oedema in rat and mouse ear inflammation [28].

Anthelmintic effect

The alcoholic extracts of seeds of evaluated for antihelminthic activity using two-enzyme system taking rat brain as a model for *Ascaridia galli* [29].

Hepatoprotective

The aqueous extract of seed furnished one hepatoprotective compound, bakuchiol 1, together with two moderately active compounds, bakuchicin 2 and psoralen 3, on tacrine-induced cytotoxicity in human liver-derived Hep G-2 cells. [30].

Osteoblastic proliferation

Fruit extracts exhibited osteoblastic proliferation stimulating activity in UMR 106 cell line cultured in vitro. The flavonoids of corylin and bavachin

were isolated and identified as active principles by activity-guided fractionation. The fruits extracts and corylin and bavachin might stimulate bone formation of have potential activity against osteoporosis [31].

Antioxidants

The powder and extracts of seed was isolate 4 compound such as bakuchiol, corylifolin corylin and psoralicin. These compound are strong antioxidant activities; a meroterpene and four flavonoids were isolated from the seed as antioxidative components. Bavachinin, bakuchiol, barachin, isobavachin and isobarachalcane are showed broad antioxidative activities in rat liver microsomes and mitochondria. They inhibited NADH-dependent ascorbate +--BuOOH- and CCl₄ induced lipid peroxidation in microsomes. They also prevented NADH-dependent and ascorbated induced mitochondrial lipid peroxidation in microsomes. Bakuchiol was the most potent antioxidant in microsomes and the inhibition of oxygen consumption induced by lipid peroxidation was time-dependent. Furthermore, bakuchiol protected human red blood cells against oxidative haemolysis. These phenolic compounds in *P.corylifolia* were shown to be effective in protecting biological membranes against various oxidative stresses [32]

DNA polymerase and Topoisomerase II inhibitors

An ethanol extract of seed caused strong DNA polymerase inhibition in a whole cell bioassay specific for inhibitors of DNA replication enzymes. Bioassay directed purification of the active compounds led to the isolation of the new compound corylifolin 1 and the known compounds led to the isolation of the new compound bakuchiol 2 as DNA polymerase inhibitors. [33].

Conclusion

P. corylifolia , the important medicinal plant is the unique source of various types of compounds having diverse chemical structure. Very little work has been done on the biological activity and plausible medicinal applications of these compounds and hence extensive investigation is needed to exploit their therapeutic utility to combat diseases. A drug-development programme should be undertaken to develop modern drugs with the compounds isolated from *P. corylifolia*. Although crude extracts from seeds of *P. corylifolia* have medicinal applications from time immemorial, modern drugs can be developed after extensive investigation of its bioactivity, mechanism of action, pharmacotherapeutics, toxicity and after proper standardization and clinical trials. As the global scenario is now changing towards the use of nontoxic plant products having traditional medicinal use, development of modern drugs from *P. corylifolia* should be emphasized for the control of various diseases. In fact, time has come to make good use of centuries-old knowledge on *P. corylifolia* through modern approaches of drug development. For the last few years, there has been an increasing trend and awareness in *P. corylifolia* research. Quite a significant amount of research has already been carried out during the past few decades in exploring the chemistry of different parts of *P. corylifolia*. Several therapeutically and industrially useful preparations and compounds have also been marketed, which generates enough encouragement among the scientists in exploring more information about this medicinal plant. An extensive research and development work should be undertaken on *P. corylifolia* and its products for their better economic and therapeutic utilization.

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